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MATTERS RELATED TO THE KYOTO PROTOCOL

MATTERS RELATED TO DECISION 1/CP.3, PARAGRAPH 5

LAND-USE CHANGE AND FORESTRY

Report on the initial SBSTA workshop on land-use, land-use change and forestry related to the Kyoto Protocol

Note by the secretariat

I. MANDATE

1. The Subsidiary Body for Scientific and Technological Advice (SBSTA), at its eighth session, requested the secretariat to organize a workshop prior to the fourth session of the Conference of the Parties (COP 4) with participation by experts including those engaged in the Intergovernmental Panel on Climate Change (IPCC) process, possibly coincident with an IPCC expert meeting (FCCC/SBSTA/1998/6, para. 45 (d)). The purpose of the workshop would be to consider data availability based on definitions used by Parties and international organizations, including their implications, in relation to Article 3.3 of the Kyoto Protocol and to consider any further inputs to the IPCC, including to special report on land-use, land-use change and forestry to be prepared by the IPCC. It also agreed to plan a second workshop after COP 4 to focus on issues arising from Article 3.4 and document FCCC/SBSTA/1998/INF.1,

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* Including the ninth sessions of the Subsidiary Body for Scientific and Technological Advice and the Subsidiary Body for Implementation.

the comments submitted by Parties and issues arising from the first workshop. It requested the secretariat to report on the initial workshop at the ninth session of the SBSTA.

II. REPORT OF THE WORKSHOP

2. As requested, the secretariat of the UNFCCC organized a workshop on land-use, land-use change and forestry. The workshop was held at the headquarters of the United Nations Food and Agriculture Organization (FAO) in Rome, Italy on 24 and 25 September 1998. The workshop focused on data availability based on definitions used by Parties and international organizations, including their implications, in relation to Article 3.3 of the Kyoto Protocol. The workshop was coincident with an IPCC expert meeting which aimed to prepare an outline for the special report requested by the SBSTA on land-use, land-use change and forestry. In preparing for the workshop, the secretariat compiled submissions from Parties on Article 3.3 of the Kyoto Protocol (FCCC/CP/1998/MISC.1).[1] It also prepared an informal short matrix of the key definitions and issues provided by Parties in their submissions (annex I).

3. The workshop was co-chaired by Mr. Maciej Sadowski (Poland) and Mr. Paul Maclons (South Africa). It was attended by 97 representatives nominated by Annex I and non-Annex I Parties, environmental organizations and private sector companies. Approximately 65 experts engaged in the preparation of the outline for the IPCC special report also attended.

4. Dr. Henri Carsalade, Assistant Director-General, Sustainable Development Department, FAO, welcomed the participants on behalf of FAO. Dr. Robert Watson, Chairman of the IPCC, gave presentations on the preliminary plans of the IPCC related to the preparation of the special report. Based on the presentations, participants agreed that the broad outline of the special report was acceptable, but that submissions from Parties related to Article 3.4 of the Kyoto Protocol, due on 1 October 1998, together with information developed in the planned SBSTA workshop on Article 3.4, should be considered in the preparation of relevant chapters.[2]

5. It was noted by the co-chairmen that the special report, while assessing the implications of Article 3.3 and 3.4 of the Kyoto Protocol for the IPCC 1996 Revised Guidelines for National Greenhouse Gas Inventories, is unlikely to develop detailed tables, formats and instructions. Similarly, detailed tables, formats and instructions for project level activities will not be provided. As it would be desirable for any reporting formats at the national and project level to be scientifically consistent, the SBSTA may need to clarify whether and when such materials should be developed by the IPCC.

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[1] The secretariat has subsequently compiled additional submissions from Parties on land-use, land-use change and forestry. These are contained in documents FCCC/CP/1998/MISC.1/Add.1 and FCCC/CP/1998/MISC.9.

[2] A detailed outline of the special report was not available to participants at the conclusion of the workshop. Subsequently, the IPCC reviewed and approved an outline at its fourteenth session in Vienna, Austria, 1-3 October 1998 (annex II).

6. A discussion of definitions related to Article 3.3 was stimulated by presentations made by Dr. Gyde Lund, Integrated Resources Inventories and Assessments, on a compilation of international definitions for terms such as forests, afforestation, reforestation, deforestation and forest degradation, and also by Mr. Rudi Drigo, FAO, who provided information on a possible framework for reaching agreement on definitions. The participants broadly agreed that definitions will be a critical aspect of the IPCC special report and that such definitions should cover above- and below-ground carbon.

7. Mr. Christopher Prins, Senior Forestry Officer, United Nations Economic Commission for Europe (ECE) and Mr. Gert-Jan Nabuurs, Forest Research Institute, Finland, gave presentations on current efforts to collect and analyse data from Annex I Parties. Sample data as compiled by the ECE on European forests for the Third Ministerial Conference on the Protection of Forests in Europe, held in Lisbon in June 1998, were presented.

8. Sixteen representatives of Parties included in Annex I to the Convention[3] made presentations on the availability of forest and soil data, methods of collecting and storing data and related issues.[4] Abstracts of the presentations received by the secretariat as at 14 October 1998 are contained in annex III.

9. The presentations highlighted the unique aspects of data collection programmes in different countries. Many countries have a long history of collecting forest data, but most programmes were not designed to address the unique needs of the Kyoto Protocol. Four representatives (of Finland, New Zealand, Norway, and Sweden) provided preliminary information on possible "emission offsets" that might be possible for their respective countries, assuming different FAO and IPCC definitions for terms such as deforestation, reforestation and afforestation. The co-chairmen noted that other countries should be encouraged to undertake this type of analysis for both Article 3.3 and 3.4.

10. Finally, the co-chairmen noted an offer by the United States of America to host the planned workshop on Article 3.4 in 1999, but left a decision on the matter to the SBSTA.

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[3] Australia, Austria, Canada, Denmark, Finland, Iceland, Italy, Japan, the Netherlands, New Zealand, Norway, Sweden, Switzerland, Ukraine, the United Kingdom of Great Britain and Northern Ireland and the United States of America.

[4] A representative of Brazil also made an informal presentation on forests in Brazil.

Annex I

MATRIX OF DEFINITIONS BASED ON SUBMISSIONS BY PARTIES[1]

1: How should forests be defined?	
AUSTRALIA	The definition used is similar to that of the FAO: Forest is an area, incorporating all living and non-living components, that is dominated by trees having usually a single stem and a mature or potentially mature stand height exceeding 2 metres, and with existing or potential projected cover of overstorey strata about equal to or greater then 20 per cent. Countries should be able to employ a definition of forest appropriate to their particular biophysical circumstances.
AUSTRIA on behalf of the EUROPEAN COMMUNITY and its member States	The definition need to be linked to data on the dynamics and equilibrium or time average values of carbon uptake and storage. Definitions in terms of crown cover would not be useful unless it is linked to carbon stock data in this way. The SR should take into account the UN-ECE/FAO TBFRA 2000 and other current definitions.
FINLAND	According to the Finnish system, forestry land (86 per cent of land area) is grouped into three classes according to site productivity: 1) forest land, where the potential annual increment is at least 1 m3/HA (20.0 mill. HA or 66per cent of land area). 2) scrub land (unproductive forest land), where the potential annual increment is between 0.1 - 1.0 m3/HA (3.0 mill. HA or 10 per cent of land area). 3) waste land, unless naturally treeless, produces less than 0.1 m3/HA per year.
ICELAND	A broad definition has to be used. A narrow definition would introduce the danger of exclusion by Parties of deforestation activities on the grounds that an area being cleared does not meet the definition of a "forest". Restrictive definitions, which might be appropriate for the mapping of economically important forest resources (such as the FAO definition quoted in page 19 of document FCCC/SBSTA/1998/INF.1) should be avoided. The capacity of a forest to sequester carbon is to be quantified by the Parties. The contribution of a forest to the assigned amount will therefore be determined by its capacity to remove carbon, not by arbitrary defining criteria such as tree height or cover.

[1] Based on submissions received as at 30 August 1998, from Australia, Austria on behalf of the European Community and its member States, Finland, Iceland, Japan, New Zealand, Philippines, Samoa on behalf of the Alliance of Small Island States, Switzerland, and the United States of America, as contained in miscellaneous document FCCC/CP/1998/MISC.1. The texts in this matrix have been lightly edited by the secretariat, but no significant formal editing has been undertaken.

JAPAN	UN-ECE/FAO, 1997 defines the forest most rigorously (see page 32 in document FCCC/CP/1998/MISC.1). This definition has the following issues to be discussed: Land which has the same carbon removal effect as forests could be excluded from the "forests". Orchards and city parks could be examined in Article 3.4 or it is also possible to make a new definition of the forests that can include orchards and city parks etc.
NEW ZEALAND	It should take into consideration the context or purpose for which land is being managed. The issue for any definition will be how can the establishment (or removal) of a "forest" be distinguished from other land-use activities?
PHILIPPINES	"Forests" should be viewed as ecosystems which includes all living organisms (flora and fauna) as well as non-living components (litter, soils, water, etc.). If this concept is adopted, it will solve the issue of having a too narrow definition of forests. More specifically: A minimum crown cover of 10per cent must exist in wild or natural conditions and there must be absence of agricultural cultivation.
SAMOA on behalf of the Alliance of Small Island States (AOSIS)	To be defined by the IPCC special report.
SWITZERLAND	The application of the Kyoto Protocol should not lead to incentives for deforestation and forest degradation. Furthermore, sustainable forest management practices which contribute to high carbon sequestration, preserve biodiversity and soil quality and serve important socio-economic ends (e.g., as shelterwood), should be duly recognized in the context of the implementation of the Protocol. The terms reforestation, afforestation and reforestation need to be defined accordingly.
UNITED STATES OF AMERICA	A number of options are available with regard to the language in Article 3.3, 3.4 and 3.7 especially with respect to key terms. An examination of these options must be guided by the following: 1. Interpretations should be consistent with the level of commitment Parties agreed to for the first commitment period. 2. Interpretations of key LUCF terms should be based on sound science. 3. Interpretations should promote other environmental objectives related to land use, recognizing tradeoffs and complementaries among environmental goals. 4. Interpretations of land use and forest activities should create appropriate incentives. To assist in the tasks of developing potential interpretations, the USA have provided a compilation of definitions used in the United States and internationally for the terms deforestation, afforestation, reforestation, and other key forest and land use terms (see page 59-78) of document FCCC/CP/1998/MISC.1. The IPCC should use a set of objectives questions as part of the evaluation of alternative interpretations of key terms (see question 11 below)

2: How should afforestation be defined?	
AUSTRALIA	The IPCC guidelines provide definitions of both afforestation, reforestation expressed in terms of land use change. Both definitions refer to "planting"of forests. Clarification is needed to reflect that deliberate tree establishment can occur by a variety of techniques other than direct planting (e.g. aerial seeding, burning to promote seed germination and regeneration of some Australian forest species). It is noted that the terms "afforestation" and "reforestation"do not include replantings in existing forest areas. Similarly, plantations established by removal of native forest would not meet a definition of "reforestation". In neither case is there a land use change. The IPCC definitions rely on interpretation of afforestation and reforestation of lands which historically have not contained forest. The situations of afforestation and reforestation will vary according to the circumstances of a country. "Historical" is best interpreted in the local context.
AUSTRIA on behalf of the EUROPEAN COMMUNITY and its member States	For the first commitment period of the Kyoto Protocol it would not suffice to specify that afforested land pertains to areas which were not covered by forests in 1990. Final definitions should be made by SBSTA on the basis of the SR.
FINLAND	In Finland, the term afforestation is used in accordance with the terminology in the Forest Resources Assessment 1990: "Artificial establishment by planting or seeding of forest on an area of agricultural or other (non-forest) land".
JAPAN	The definition shown in "Revised 1996 IPCC Guidelines"have several issues to be resolved. The distinction between "afforestation" and "reforestation" is not clear. The term "historically" is not defined clearly. A possible definition for discussion purposes only[2]: Planting of new forests on lands which have not been containing forests for more than 50 years. There is inconsistency in the FAO definition on afforestation, reforestation, deforestation
NEW ZEALAND	During the course of the negotiations of Article 3(3) of the Protocol it had been our understanding that the activities of "afforestation, reforestation and deforestation" would be interpreted on the basis of land-use changes that have occurred since 1 January 1990. Hence, a land-use change based interpretation of these activities should apply unless and until SBSTA adopts an alternative interpretation.
PHILIPPINES	It should be defined as: "the intensive planting of trees on lands which historically have not contained forest". If we consider that in the Philippines almost all lands have been previously forested and that it is estimated that when the Spaniards came in 1521, there were 90per cent forest cover, then there is hardly any area that may be considered for afforestation.
SAMOA on behalf of the Alliance of Small Island States (AOSIS)	To be defined by the IPCC special report.
SWITZERLAND	See comments on question 1 above.

3: How should reforestation be defined?	
AUSTRALIA	See comments on question 2 above.
AUSTRIA on behalf of the EUROPEAN COMMUNITY and its member States	The IPCC should take into account that forest management that does not lead to an increase in carbon stocks, should not be used to meet the commitments under Art.3.3. The SR should present implications of different options with regard to the time-interval between land-use conversion and reforestation as well as absolute time-limitations.
FINLAND	In Finland, the term reforestation is used in accordance with the terminology in the Forest Resources Assessment 1990: "Artificial or natural re-establishment of forest on previously forest or other wooded land. Artificial reforestation may be by planting or seeding".
ICELAND	The likelihood of perverse actions can be reduced through the definition of "reforestation" as suggested in document FCCC/SBSTA/1998/INF.1.
JAPAN	A possible definition for discussion purposes only[2]: " Planting of forests on lands which have previously contained forests within last 50 years, but which have been converted to some other use and the physical condition not to meet the definition of forests."[2] Common condition for these definitions: these activities are to be judged by the unit area of 0.5 ha.
NEW ZEALAND	See question 2. In addition, New Zealand notes that any definition for afforestation and reforestation should be based on the establishment (rather than planting) of a forest.
PHILIPPINES	The Phillippines agree with the IPCC definition. It favour use of the word "establishing" rather than "planting" to include both natural and artificial means.
SAMOA on behalf of the Alliance of Small Island States (AOSIS)	To be defined by the IPCC special report. Additional questions related to these issues are presented in pages 48-49 of document FCCC/CP/1998/MISC.1.
SWITZERLAND	See comments on question 1 above.
UNITED STATES OF AMERICA	See comments on question 1 above.

4: How should deforestation be defined?	
AUSTRALIA	The IPCC guidelines provide an interpretative definitions expressed as a conversion from forest to another land-use. Deforestation is the same as "land use change". Harvesting does not express the same because there is no change in land use.
AUSTRIA on behalf of the EUROPEAN COMMUNITY and its member States	The deforestation after 1990 of any forests (and not just of those which have been planted after 1990) should be penalised. The conversion of forest land to other land-use may be a good starting point for the definition of deforestation. Other items like the time period item and the definition of forests will have to be addressed as well.
FINLAND	There is no equally precise definition, but the FAO definition corresponds to the Finnish national practice: "Deforestation refers to change of land use with depletion of tree cover to less than 10 per cent" (FAO Forestry paper 112, p 10. FAO, Rome 1993). It would mean that land now considered as forest land would become non-forest land.
JAPAN	Make a definition of deforestation consistent with the definitions of afforestation and reforestation. A possible definition for discussion purposes only (see footnote 2): Converting forests to some other use and making the physical conditions of the land not to meet the definition of forests. If deforestation is defined as "converting forests to some other use", it could cause confusion, (since the criteria of "conversion of use" allows willful interpretations and does not directly link to the emission/removal of CO_2).
NEW ZEALAND	See para. 7 in page 44 of document FCCC/CP/1998/MISC.1.
PHILIPPINES	It refers to the change of land-use from forest to other land-use and the depletion of forest crown cover to less than 10per cent. However, we do not see the reason for distinguishing human-induced and natural causes of forest loss.
SAMOA on behalf of the Alliance of Small Island States (AOSIS)	To be defined by the IPCC special report. Additional questions related to these issues are presented in page 49 of document FCCC/CP/1998/MISC.1.
SWITZERLAND	See comments on question 1 above.
UNITED STATES OF AMERICA	See comments on question 1 above.

5: Comments on the IPCC special report (SR)?	
AUSTRALIA	The IPCC should provide technical advice on "direct human induced activities". The report should provide guidance on interpretation of estimates of emissions and sinks associated with afforestation, reforestation and deforestation, so that the results meet the criterion of verifiability.
AUSTRIA on behalf of the EUROPEAN COMMUNITY and its member States	The IPCC SR should include discussion of and data illustrating the consequences of alternative definitions of the key terms. The discussion should include the implications of different definitions not only in terms of climate change and in terms of quantitative impacts on emission budgets of Parties but also in terms of other issues like biodiversity and forest management.
JAPAN	See page 41 of document FCCC/CP/1998/MISC.1 for extensive comments of Japan on this issue.
SAMOA on behalf of the Alliance of Small Island States (AOSIS)	The special report should examine, inter alia, the technical and scientific issues related to forests, other land uses, and land-use change, including implications of forest and land-use change activities, and sequestration strategies and practices on water, soils, biodiversity, and other environmental and socio-economic effects; and the overall contribution of forests, land-use, and land-use change to global emissions by sources and removals by sinks.
SWITZERLAND	It should develop adequate guidelines taking into account the IPPC SR and relevant existing guidelines (e.g., the Guidelines for Sustainable Forest Management).
UNITED STATES OF AMERICA	The focus should be on the methodological, scientific, and technical implications of alternative interpretations of the relevant articles of the Protocol, particularly Articles 3.3 and 3.4. The special report should use full anthropogenic carbon stock accounting as the reference point for consideration of key terms in the Protocol related to land use, land use change and forestry activities. The special report should include assessments of: the overall contributions (short and long run) from land use activities, land use change and forestry; the implications of the potential approaches for the key terms in Article 3.3; other activities that should be considered under Article 3.4; inventory and data availability to report these activities; Shortcoming and limitations of only counting these activities versus full and comprehensive accounting.

6: Information on methods relevant to the implementation of Article 3.3?	
AUSTRALIA	It requires clear definitions of the key-terms and further clarification (foundation: IPCC 1996 Revised Guidelines).
AUSTRIA on behalf of the EUROPEAN COMMUNITY and its member States	Outcome of the IPCC SR is indispensable for conclusions and decisions of COP/MOP. The SBSTA 8 conclusions are important.
SAMOA on behalf of the Alliance of Small Island States (AOSIS)	To be defined by the IPCC special report. Additional questions related to these issues are presented in pages 50-51 of document FCCC/CP/1998/MISC.1.
SWITZERLAND	Decisions on the implementation of Article 3.3 (and 3.4) should not be taken before the conclusion of the work of IPCC on its SR. The implementation of Article 3.3. should respect the goals of the Biodiversity Convention as well as the Framework Principles for the Protection of Forests.
UNITED STATES OF AMERICA	The US believe that ultimately, the job of interpretation of the text is best left to the Parties. It recognizes that, while not explicit in the Kyoto Protocol, it is desirable to seek a common approach among Parties in defining the activities referred to in Articles 3.3 and 3.4 of the Kyoto Protocol.
7: Should policies and programmes be counted as direct human-induced activities or only the physical activities on the land?	
AUSTRALIA	The IPCC SR on LUCF and carbon emissions should clarify boundaries between human and natural phenomena
AUSTRIA on behalf of the EUROPEAN COMMUNITY and its member States	Policies and measures on afforestation, reforestation and deforestation within agreed definitions of these terms should be counted, provided these can be reflected in a verifiable manner in the national inventory. Double-counting has to be avoided. Actions to reduce deforestation will automatically be reflected in reduced or zero deforestation rates under the provisions of Art.3.3. Additional accounts to meet commitments under Art.3 would not be appropriate. Similarly human induced fires to clear land would presumably count as deforestation, and actions to reduce or contain them would be reflected in reduced deforestation rates. The wider question of fire management is problematic and will presumably be an important part of the SR
FINLAND	Assessing which changes are human-induced and which are not is also difficult. In Finland, for instance, natural revegetation is allowed to occur on former agricultural lands. Yet it is uncertain whether this generation of new forests will be considered as direct human-induced activity although it is land owners' decision not to carry out agricultural practices any more.

ICELAND	Policies and programmes should be counted as direct human-induced activity as long as the link between the policy and the resulting removals can be demonstrated. The consequence of the activity in terms of carbon dioxide removal is what matters, not the original intent behind the action. Actions to reverse activities that have negative impact on the update of carbon should also be included. Take note that the outcome of the negotiations to the UNFCCC was that uptake which could be attributed to direct actions taken by Parties should enter into the calculations.
NEW ZEALAND	When defining the term "direct human-induced" it should be recognised that decisions by humans to intervene in, or withdraw from, the management of areas of land can directly lead to changes in carbon stocks. For example, the withdrawal or cessation of agricultural land-use practices can allow natural revegetation to occur on such land.
PHILIPPINES	Policies are not to be counted: only the physical activities since not all policies are religiously implemented.
SAMOA on behalf of the Alliance of Small Island States (AOSIS)	The AOSIS raised several questions related to direct-human activities in page 49 of document FCCC/CP/1998/MISC.1, to be defined by the IPCC special report.
8: How many and which carbon pools have to be included in the definition of carbon stocks?	
AUSTRALIA	The areas of land which have been afforested, reforested and deforested since 1990 need to be measured as changes in carbon stocks over the period 2008 to 2012. Carbon accounting should include all above ground living and non-living vegetation, litter, soil carbon and carbon in wood products.
AUSTRIA on behalf of the EUROPEAN COMMUNITY and its member States	All pools of non-fossil carbon linked to the activities in Art. 3.3 should be counted so long as they can be verified and reported in a transparent manner. The EU endorses the system accounting for all changes of all carbon stocks and claiming limited use to meet commitments under Art.3 for real changes. Each party should provide data to establish its level of carbon stocks in 1990 and to enable an estimate to be made of its changes in stocks in subsequent years. The special report should focus on Land-Use Change and Forestry and not on landfills and harvested wood products. All carbon stocks associated with the afforestation, reforestation and deforestation activities under Art. 3.3 should be counted, including the soil C stock and gaps in the knowledge on soil carbon including time frames of changes in soil carbon The SR should give options and implications to the addition of harvested wood products.
FINLAND	The National Forest Inventory (NFI) of Finland is the basis for the monitoring of the carbon storage of forests(provides high accuracy). For carbon emission and removal inventory purposes, the whole-tree biomass as well as soil carbon, and, in particular, changes in these pools are of interest. It may happen that a country whose forests as a whole are a carbon sink, may get a negative balance if only the change in the forest area only is taken into account and not the change in the carbon stock. The whole forest stock and changes to it should be viewed from the long term. Theoretically, in regenerated areas in the northern latitudes, if a certain forest area would be cleared for other purposes and an equal areal would be afforested elsewhere, i.e. total forest area would remain constant, there would be a negative CO_2-balance during the first budget period.

ICELAND	The five year commitment period is a short time compared to the turnover time of most of the important carbon pools. Measurements outside the commitment period coupled with modelling of the dynamics of carbon pools will be required. Methods of estimation and time averaging will have to be applied. No exclusion of any carbon pool is proposed.
JAPAN	Clear definitions may be necessary to determine which carbon stocks are to be included. An example: Six types of carbon stocks are classified as follows: 1.above-ground biomass (trunk, leaves, branches etc.) 2. below-ground biomass (roots) 3. slash (fallen leaves, branches) 4. soils 5. wood products (harvested wood, pulp, wooden products, construction materials, houses, firewood) 6. wooden wastes (landfills etc.) One example of the definition is to consider 1 to 4 of above classifications as carbon stocks. However the points presented in page 40 of document FCCC/CP/1998/MISC.1 are needed to be paid attention.
PHILIPPINES	C in all the five pools should be included in the analysis of C stock. There are very limited information available for humid tropical forests in developing countries. Of the five pools, only the above-and-below ground biomass and soils could be measured with some ease. Landfills should not be considered as poll for carbon stock under forestry.
SAMOA on behalf of the Alliance of Small Island States (AOSIS)	The AOSIS raised several questions related to carbon stocks in pages 49-50-51 of document FCCC/CP/1998/MISC.1, to be defined by the IPCC special report.
SWITZERLAND	A comprehensive approach needs to be applied. This implies the accounting of all relevant carbon pools. As a minimum, the organic layer and soil carbon must be included in calculations.
UNITED STATES OF AMERICA	See comments related to carbon stock accounting under question 5 above.
9: How should the term "planting" be defined?	
AUSTRALIA	"Planting" should reflect the variety of planting techniques (such as aerial seeding and fire germination)
AUSTRIA on behalf of the EUROPEAN COMMUNITY and its member States	Natural revegetation should not be excluded from direct human induced forest activities. It might be a policy of human forest management. However, natural revegetation needs clear criteria for when natural vegetation is to be regarded as a consequence of direct human induced activity.

JAPAN	Under the Japanese proposal for definition of afforestation, reforestation and deforestation, the term planting is limited to direct human-induced activities.
SAMOA on behalf of the Alliance of Small Island States (AOSIS)	To be defined by the IPCC special report.
UNITED STATES OF AMERICA	See comments on question 1 above.
10: How should the term "historical" be defined?	
AUSTRALIA	Historical should be interpreted according to the relevant national context.
AUSTRIA on behalf of the EUROPEAN COMMUNITY and its member States	The term should be quantified. It is expected that the SR explores various options which should include a range of years.
PHILIPPINES	A setting of 20 years as the minimum is agreeable. One possible problem though is how individual country reports will be verified.
SAMOA on behalf of the Alliance of Small Island States (AOSIS)	To be defined by the IPCC special report: How would different definitions of the term "historical" affect accounting during the first commitment period?
UNITED STATES OF AMERICA	See comments on question 1 above.
11: Comments about data and methodology?	
AUSTRALIA	Australia is building upon its national GHG inventories by establishing a world class National Carbon Accounting System for terrestrial sources and sinks.
AUSTRIA on behalf of the EUROPEAN COMMUNITY and its member States	We propose to install a carbon accounting method for over sufficient time scales to reflect changes in long-term carbon storage as the appropriate basis for the partial accounting system, and consistent with full carbon stock accounting for relevant activities in the longer term. More specific information is required to calculate CO_2 uptake over delayed time frames in the case of increases in forest area. The simple default approach does not provide a basis for a credible final inventory.

ICELAND	IPCC inventory guidelines are to be used for measuring the removal of CO_2 as verifiable changes in stocks of carbon. It is useful to make a distinction between project-based and inventory-based accounting.
JAPAN	The accuracy of data should be improved to increase verifiability with respect to the change in volume of carbon stocks in each categories of No.1 to No.4 mentioned in question 8 above as forests grow. In the case of below-ground biomass and slash, further measurement and data collection are needed to improve the default values. In case of soil, it is also necessary to develop measuring method on carbon flux from ecosystem including soil respiration.
SAMOA on behalf of the Alliance of Small Island States (AOSIS)	The AOSIS raised several questions related to these issues in pages 49-50-51 of document FCCC/CP/1998/MISC.1, to be defined by the IPCC special report.
SWITZERLAND	In order to maintain consistency in inventory data quality, methodologies need to be identified that achieve a degree of uncertainty in the LUCF sector that is comparable to the average quality reached in the other activity sectors. On the basis of the IPCC special report and taking into account relevant existing guidelines (e.g. the Guidelines for Sustainable Forest Management adopted by the Ministerial Conference of the Protection of Forests in Europe) , adequate guidelines need to be worked out before the accounting of activities in the LUCF sector is authorized under the Kyoto Protocol.
UNITED STATES OF AMERICA	The IPCC should use a set of objectives questions as part of the evaluation of alternative interpretations of key terms. For each potential interpretation, the IPCC should address: Can inventory methods and reporting guidelines be developed and made available (or are they already available)?; What are the data requirements and uncertainties for the inventory methods and reporting guidelines?; What structural problems and accounting gaps exists? What uncertainties exist in our scientific understanding of the effect of LUCF on the carbon cycle?; Can discounting systems be developed to adjust estimates for uncertainty and risk?
12: What does the term "transparency" mean?	
AUSTRIA on behalf of the EUROPEAN COMMUNITY and its member States	The definition of transparency offered in para. 59 of document FCCC/SBSTA/1998/INF.1 is the generally accepted one, and will also be relevant to any supplementary information called for under the provisions of Art. 7.
ICELAND	Parties should be required to demonstrate that carbon pools which are not reported are not degraded by the reported activity.
SAMOA on behalf of the Alliance of Small Island States (AOSIS)	The AOSIS raised several questions related to these issues, in page 51 of document FCCC/CP/1998/MISC.1, to be defined by the IPCC special report

SWITZERLAND	The same principles and standards on LUCF related activities should be applied throughout the Kyoto Protocol. The accounting of activities under Articles 6 and 12 of the Protocol should not be in contradiction with the accounting of activities under Article 3.3.
UNITED STATES	See comments on question 11 above.
13: What is meant by "verification"?	
AUSTRIA on behalf of the EUROPEAN COMMUNITY and its member States	There is also an existing definition by the OECD in document ENV/EPOC/98/5. The SR should discuss also methods for verification of emission data of the LUCF activities taking into account possible cost implications of data collection also and notes that direct field measurement of greenhouse gas fluxes might also be relevant to verification. The definition of verification must be even handed with respect to both gains and losses of carbon stocks. It would be unacceptable to use different verification criteria amongst the afforestation, reforestation and deforestation activities.
FINLAND	The time element is very important when considering carbon sequestration. Under the Finnish monitoring system, it is not possible to distinguish between afforestation and reforestation if the IPCC definitions are used because precise data are lacking on historical land use or its changes.
ICELAND	Quantification of carbon removals from projects is technically simpler and generally more transparent than inventory-based accounting and can be verified more directly.
JAPAN	The Japanese example on afforestation, reforestation and deforestation proposed for further discussion would enable to keep high level of transparency and verifiability in the accounting methods.
SAMOA on behalf of the Alliance of Small Island States (AOSIS)	See comments on question 12 above.
UNITED STATES OF AMERICA	See comments on question 11 above.

Annex II

INTRODUCTION AND OUTLINE - IPCC SPECIAL REPORT ON LAND-USE, LAND-USE CHANGE AND FORESTRY[1]

Approved Outline: IPCC XIV

Chairman: Dr. Robert Watson

Introduction

The Special Report on Land Use, Land Use Change and Forestry is being prepared in response to a request from SBSTA at its Eighth Session (Bonn, 2-12 June 1998).

The outline of the IPCC Special Report on Land Use, Land Use Change and Forestry was approved by the IPCC Panel at its Fourteenth Session. This outline responds to the SBSTA mandate and addresses issues raised in FCCC/SBSTA/1998/INF1.

It has been designed to provide scientific, technical, economic and social information that can assist governments operationalize Article 3.3 of the Kyoto Protocol. In addition it will provide information relevant to assessing the potential for other human-induced additional activities as mentioned in Article 3.4 and issues associated with operationalizing this Article. It also provides information relevant to other Articles of the Kyoto Protocol. While the Special Report will primarily focus on carbon dioxide, it should address methane and nitrous oxide as appropriate.

The Special Report will be policy relevant, but will not be policy prescriptive.

The IPCC Panel has approved the topics that need to be addressed in the Special Report, but will allow the lead authors to re-organize the outline to minimize duplication of topics and ensure the most logical flow of information. The IPCC Panel did request that the outlines of the chapters dealing with Articles 3.3 and 3.4 be as parallel as possible. The Panel also recognized that the content of different chapters is closely linked, therefore, noting that many chapters will need to have common lead authors to ensure consistency. In addition, there is a need for common lead authors with the relevant chapters in the Third Assessment Report.

The Special Report on Land Use, Land Use Change and Forestry will be approved and accepted by the Panel meeting in a Plenary Session since it cuts across the three working groups and the task force on National Greenhouse Gas Inventories (TFI). The procedures for the preparation, review acceptance, approval and publication of IPCC Special Reports shall apply.

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[1] This document was provided by the Chairman of the IPCC, Dr. Robert Watson. It is reproduced without formal editing.

The Special Report will be chaired by R. Watson and guided by two "overall co-ordinating lead authors". Each chapter will have one or two co-ordinating lead authors in addition to numerous lead and contributing authors. There will be a steering committee for this Special Report comprising of the IPCC Chair, two IPCC Bureau members from each working group (one of the co-chairs and one vice chair) and the chair of the task force on inventories who will approve the selection of co-ordinating lead authors and lead authors and oversee the whole process. The Secretary of the IPCC and the heads of the working group technical support units will be ex-officio members of the steering committee. There will be a one-person technical support unit for this report located with the Chair, IPCC Secretary or one of the working group technical support units (funding and the identification of the individual for this position has yet to be identified).

Outline

Summary for Policymakers (5-10 pages)

Chapter 1 – Introduction and Mandate (2 pages)

This chapter will briefly discuss the SBSTA mandate and the relationship of this Special Report to the IPCC Third Assessment Report.

Chapter 2 - Global Perspective (10 pages)

This chapter will be a primer to explain how the carbon cycle operates, and the potential to influence the atmospheric concentrations of greenhouse gases by land-use activities.

Executive Summary

2.1 *Introduction*

2.2 *Biogeochemical Cycles* (global stocks, flows, processes, timescales and uncertainties)

2.3. *Terrestrial Ecosystems and the Role of Management* (sources, sinks and stocks by land cover type, land-use and region)

2.4. *Global Greenhouse Gas Emission Reductions and Sequestration Potential* (competition for land)

2.5. *Features of Global Carbon Models and National Inventories*

Chapter 3 - Implications of Different Definitions and Generic Issues (30 pages)

This chapter will focus on exploring the implications of different definitions on the Kyoto Protocol, the different methodologies that can be employed to measure and assess carbon stocks and pools, and issues associated with accounting and reporting.

Executive Summary

3.1 *Introduction*

3.2 *Implications of Different Definitions by Broad Category* (e.g., forests, afforestation, reforestation, deforestation, forest degradation, sustainable forest management, restoration of degraded lands, agriculture and land practices, and full carbon accounting and its anthropogenic implications)

3.3 *Measurement of Above and Below Ground Biomass and Soil Carbon* (stocks -- remote sensing and in-situ; flows -- direct flux measurements and stock differences; accuracy and precision; verifiability; propagation of errors; effects of contiguous and non-contiguous commitment periods; integration and consistency of methods -- national inventories and modeling).

3.4 *Accounting and Reporting Issues* (Direct human-induced vs indirect human-induced vs natural; program vs project activities; baselines - 1990 baselines, 1990-2007 baselines; stock differences 2012-2008; attribution of stocks and changes in stocks -- pre-1990 vs post-1990 activities; fires and pests; permanence, additionality; leakage; techniques for treating uncertainties; and costs of accounting and reporting).

Chapter 4: Afforestation, Reforestation and Deforestation Activities -- Article 3.3
(25 pages)

This chapter will address a wide range of scientific and technical issues and options associated with Article 3.3 by region.

Executive Summary

4.1 *Introduction*

4.2 *Options for definitions and their general implications* (afforestation, reforestation and deforestation)

4.3 *Processes, time-scales, and carbon accounting rules* (pools; spatial scales -- project to biome to national inventory; direct vs indirect)

4.4 *Data needs for operationalizing afforestation, reforestation and deforestation activities* (observational and modelling methods for area change in land use and carbon stock for different time periods; operational implications of uncertainties; sensitivity analysis of uncertainties; verification)

4.5 *Data availability* (ground, aircraft and satellite data for land use/cover and carbon stocks in all pools by ecosystem - at the project, biome and national inventory scale; accuracy and precision; costs; models)

4.6 *Regional and global potentials, differences and implications of afforestation, reforestation and deforestation activities* (by pool; activity type -- policies, practices, and technologies; Annex I countries and by region)

4.7 *Associated impacts of afforestation, reforestation and deforestation activities* (environmental -- biodiversity, soil quality, watersheds, etc. and socio-economic -- poverty, employment, resettlement, agriculture, forestry, etc.)

Chapter 5: Additional Human-Induced Activities -- Article 3.4 (30 pages)
This chapter will address a wide range of issues associated with assessing the potential of additional human-induced activities mentioned in Article 3.4. It will also address issues that would arise in operationalizing Article 3.4.

Executive Summary

5.1 *Introduction* (implications of Kyoto Protocol; ancillary benefits; sequestration, emissions reductions and substitution potential; additional human-induced activities -- Arable, Pastoral and Forestry Land Management, Restoration of Degraded Lands, Protected Areas, Agroforestry, Urban Expansion and Infrastructure, Modern Biomass Energy, etc.)

5.2 *Processes, timescales and carbon accounting rules* (pools; spatial scales -- project to biome to national inventory; direct vs indirect; temporary *vs* long-term sequestration)

5.3 *Data needs for operationalizing Article 3.4 activities* (past, present and projected land - use activities and cover; carbon pools; project and program; observational and modelling methods for area change in land use and carbon stock for different time periods; operational implications of uncertainties; sensitivity analysis of uncertainties; verification)

5.4 *Potential magnitude of carbon sinks and sources by activity type, regionally and globally* (barriers; costs and benefits; short vs long-term sequestration, including threats to permanence; accounting rules; detailed table on types of current land use and practices which have implications for C; detailed table on types of land use change and conversion; highlight important changes; competition for land; evolution vs additional activities)

5.6 *Land Use and its relationship to carbon and energy* (modern biomass and energy-intensive materials -- tables of specific options)

5.7 *Associated impacts of additional activities* (environmental -- biodiversity, soil quality, watersheds, etc. and socio-economic -- poverty, employment, resettlement, agriculture, forestry, etc.)

Chapter 6: Project Based Activities (10 pages)
This chapter will address the unique issues associated with project-based activities related to the Kyoto Protocol.

Executive summary

6.1 *Introduction* (relationship between projects, regional and national programs and national accounts; potential magnitude of activities in terms of land area and carbon)

6.2 *Specific issues arising from the implementation of biotic activities* (accounting units and procedures; baseline and additionality questions; leakage; permanence; risks and risk management strategies; associated costs, benefits and impacts, including employment)

6.3 *Scientific and technical aspects of monitoring, evaluation and verification* (protocols, approaches, costs and practicalities; uncertainties; pilot project experience)

Chapter 7: Implications of the Kyoto Protocol for the Reporting Guidelines (10 pages)

This chapter will review the adequacy of the IPCC reporting guidelines for the National Greenhouse Gas Inventories in light of the Kyoto Protocol assess what changes may be required. It will also assess the scientific and technical elements of an IPCC reporting framework for project-level activities.

Executive summary

7.1 *Introduction*

7.2 *Review of relevance of the IPCC Guidelines for reporting activities under the Kyoto Protocol* (implications of proposed definitions discussed in this Special Report; country case studies)

7.3 *Implications for potential additions and modifications to the IPCC National Greenhouse Gas Inventory Guidelines for different activities under the Kyoto Protocol* (elements for carbon stock accounting; periodicity of input data and implications for assessing annual fluxes; alternative methods and approaches to the Revised Guidelines; potential additions and modifications to IPCC Modules for accounting)

7.4 *Scientific and technical reporting framework for project-level activities for greenhouse gases* (elements for reporting project-level activities; reporting monitoring and verification procedures; issues related to consistency and comparability with national inventories; integration of project with national inventories)

7.5 *Supplementary information for reporting under the 1996 IPCC National Greenhouse Gas Inventory Guidelines* (identify major gaps in knowledge)

Annex III

ABSTRACTS OF PRESENTATIONS PRESENTED AT THE WORKSHOP[1]

AUSTRALIA

Australia is a large country (750 M HA, of which 150 M HA is forest) with a wide range of climates and ecosystems. As intensive agriculture began only 200 years ago, considerable land use change is still occurring. Land-use change and forestry (LUCF) and agricultural activities account for more than 30 per cent of Australia's GHG emissions.

Remote sensing is the only cost-effective way to deal with an inventory on this scale. Therefore, the National Forest Inventory and the land-use change and forestry component of Australia's GHG inventory are based on remote sensing (primarily Landsat TM), which is combined with ground and related data in a computerized data base. This allows data to be presented over a full range of scales, from project level through the national level.

Australia has modified the FAO definition of "forest" to reflect the diverse biophysical conditions of forest cover, for example to include the 11 MHA of mallee woodlands. (Mature mallee stands are of uniform height, but range from 2 to 12m in height, depending on rainfall.)

Australia has a major project to yield improved estimates of emissions from land use change (forest clearing for agriculture), based on comparison of landsat TM photos from 1991 and 1995, which spatially identify areas (to 1HA resolution) for which forest has been cleared. Ground surveys (by State Governments) give the type of vegetation involved, and representative sampling from each vegetation type allows conversion to tonnes carbon per HA. Associated changes in soil carbon (which are about half the CO_2 emissions from this source) are estimated by using the history of land use change (drawing on earlier remote sensing and other data sources). Early data from this project is incorporated in Australia's latest GH inventory.

Australia aims to treble its plantation estate by 2020. New plantations are registered with the National Forest Inventory, thus enabling good monitoring of this component of afforestation. Soil carbon accretion in these plantations is being measured.

Australia has embarked on a major new initiative, building on the work to date, to construct a National Carbon Accounting System for terrestrial activities covered by the Kyoto Protocol. This system will provide estimates of emissions and sinks to meet the Protocol requirements for transparency and verifiable data.

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[1] These abstracts have been lightly edited by the secretariat, but no significant formal editing has been undertaken.

AUSTRIA

The estimation of the emissions for the LUCF sector in Austria is based on a detailed forest inventory. This inventory is conducted by the Federal Forest Research Institute every 5 years. It is based on statistically sound and systematic sampling on a grid size of 4x4 km. This allows estimates to be made of the forest area of Austria (3.9 M. HA), the growing stock (988 M. m3) and the incremental growth per year (27 M. m3) with high accuracy, that is, better than 2 per cent. To estimate the emissions of the LUCF sector according to, the IPCC Guidelines, worksheets 5-1, were used. The changes in land use have been analyzed for each year since 1960. The calculations have been checked for consistency by using the help of a Carbon balance model called ASPECT. These analyses indicate an uncertainty for the CO_2 annual removals from changes in forest and other woody biomass stocks of about 32 per cent. Although the methodology used until now does not allow the calculation of CO_2 associated with afforestation, deforestation and reforestation activities according the Kyoto Protocol in a reliable manner, the methodology used is a good basis for providing the additional data needed.

CANADA

The data available on Canada's forests will depend very much upon the definitions of key words in Article 3.3 of the Kyoto Protocol. Specifically, these words are: forest, direct human induced, reforestation, afforestation and deforestation. Of equal importance to the "protection and enhancement of sinks" called for in the Framework Convention are the ownership and management characteristics, the nature and extent of the managed forest and the natural and anthropogenic patterns of disturbance of the forest.

The major strength of the current national forest inventory is the provision of detailed, location specific information on the physical attributes of Canada's forests. The major weakness is the inability to monitor and measure changes in these very same attributes over time.

At the same time the growing appreciation of the non-timber values that forests provide generates competing demands for additional information, namely non-timber, information needed to satisfy requirements for sustainable forest management, criteria and indicators under the Montreal Process, the Convention on Bio-diversity and forest health in general. Therefore, should a highly "restrictive" interpretation of the key words noted earlier prevail, the additional costs of measuring and verifying the changes in carbon stocks will in all likelihood exceed the benefits. Consequently, the priority given to satisfying the information demands of the limited activities included under the Kyoto Protocol will accordingly decline. If, on the other hand, a more comprehensive carbon accounting approach is taken, it is Canada's view that C sequestration in land use, land-use change and forestry can be a significant and highly attractive mitigation option in addition to the added benefits of improved soil quality for enhanced agricultural productivity and sustainability. Clearly a win-win strategy for all concerned.

FINLAND

An overview of the Finnish land-use and land-use classification was provided. In Finland, according to the FAO definition, forest land covers 71 per cent of total land area of which private non-industrial ownership is a main form of ownership. The first National Forest Inventory was carried out between 1921 and 1924; since then the changes in forest resource have been monitored very precisely. Forest inventory and wood consumption statistics provide precise data, for example, on stemwood increment, volume and drain. This allows the application of species-specific conversion factors to dry matter, total tree biomass and carbon. Present inventory techniques do not take into account all carbon pools; the methodologies of other pools are less developed and their accuracy is much more modest. During the last 30 years, the forest carbon stock has been steadily increasing and between 2008-2012 the forest carbon stock is expected to increase by 12 to 23 Tg CO_2 /yr.

The presentation also described existing inventory and monitoring methods and gave an estimation of changes in carbon stocks through afforestation, reforestation and deforestation activities during the first commitment period using different definitions. If the IPCC definitions are used, then Article 3.3 activities may be sources, while the country's whole forest carbon stock may be increasing. If FAO definitions are used, then Article 3.3 activities are estimated to be a sink. Estimates of the margins of error were presented and it was concluded that data on the whole carbon stock and its changes is more precise than data on certain activities.

ICELAND

At present, Iceland is Europe's least forested country, with less than 0.3 per cent of the total land area meeting the UN-ECE/FAO definition of forests. When other woodlands are included (with trees higher than 5 meters) this figure increases to 1.4 per cent (Prins 1998). Various lines of historical, archeological and pollen fossil evidence suggest that the current lack of forests in Iceland can be explained by the nearly wholesale, man-induced destruction of forests, particularly the native downy birch (*Betula pubescens* Ehrh.), since the settlement of the island in the ninth century. At that time, birch forests covered approximately 25 to 30 per cent of the land area. This difference (1.4 per cent at present vs. 25 to 30 per cent at settlement), amounting to over 25,000 km^2, represents the land base that could potentially be converted to forest or woodland, given a sufficient economic incentive. Afforestation projects, such as carbon offset projects, would be fully compatible with other societal and environmental objectives, such as promoting rural development, ecological restoration and preventing desertification.

Severe land degradation and desertification followed in the wake of forest destruction in Iceland. At the time of settlement, most of Iceland was covered with fertile vegetated ecosystems. At present 40 per cent of Iceland is barren desert, an additional 15 per cent harbors limited plant growth and a major proportion of the remaining land classified as vegetated (45 per cent) is severely degraded, owing to a long history of overgrazing (Arnalds et al. 1997). In addition to the potential for sequestering carbon in the form of woody biomass, there is considerable potential to sequester carbon in volcanic soils, which have a natural tendency to immobilize and bury organic carbon permanently. Increased soil carbon sequestration can be brought about by afforestation and/or other land reclamation activities.

As of 1990 the annual afforestation effort in Iceland has trebled in terms of land area planted (200 to 400 HA afforested per year in 1980 to 1989 as opposed to 1000 to1400 HA afforested each year in 1990 to 1998). One fourth of this planting represents the use of native birch for restoration of degraded land, but the remainder represents the planting of tree species for timber production and amenity. Much of this increased planting effort has been made possible by state-sponsored farm-forestry programs, but a considerable proportion is carried out by municipalities and NGOs.

Iceland has recently begun investigating the potential carbon offsets in land ecosystems, to reduce net emissions from the country. An extensive inventory of available carbon stocks is currently in progress, and this inventory forms the basis for estimating stocks that could be sequestered through direct human actions. Neither types of data are yet available, however, preliminary calculations suggest that 1 to 2 tonnes C/HA/year (100 to 200 tonnes C/km^2/year) could be sequestered in soils by revegetation of degraded land and a further 1 to 10 tonnes C/HA/year in woody biomass, via afforestation.[2]

ITALY

The availability of data on land-use, land-use changes and forestry in Italy and the quality of this information has been considered, with respect to the application of the 1996 IPCC Revised Guidelines and to the implementation of Art. 3 of the Kyoto Protocol. The only comprehensive national forest inventory was carried out by the Ministry of Agriculture and Forestry for the year 1985. In order to estimate CO_2 emissions and removals for the Second National Communication to the UN-FCCC, we have used figures provided on yearly basis by ISTAT, the National Statistics Institute, which are considerably less reliable. Since 1994, the information on areas of new planting and restocking carried out by local authorities, which could be useful for the implementation of Art. 3.3, is no longer collected by ISTAT. The only figures available for this purpose refer to new farm woodlands established under a grant scheme foreseen by the European Regulation 2080/92.

A model to estimate the amount of carbon stored in forest vegetation and soils is currently being developed, in order to meet the information needs related to Art. 3.4. To refine current estimates and provide new data for the implementation of the Kyoto Protocol, some priorities have been identified, including 1) the use of the information available in regional forest inventories and in the European carbon flux database to take into account the variability of the annual biomass increment and to provide information on changes in carbon stored in forest soils; 2) the establishment of a specific monitoring system for the areas of new planting and the relevant carbon storage; and 3) studies on the life-cycle of wood-based products.

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[2] Arnalds, Ó., Thórarinsdóttir, E.F., Metúsalemsson, S., Jónsson, Á., Grétarsson, E. and Árnason, A. 1997. Jarðvegsrof á Íslandi [Soil erosion in Iceland]. Icelandic Soil Conservation Service and Icelandic Agricultural Research Institute, 157 p. Prins, C.F.L. 1998. FAO/ECE Temperate and Boreal Resource Asssessment 2000. Enquires, definitions and interim results to carbon cycle calculation.

NEW ZEALAND

Of the 27MHA of land used in New Zealand, 23 per cent is indigenous forest (mostly government owned conservation estate in which there is some sustainable harvesting on a very small percentage) and about 5 per cent is exotic species plantation forest (mostly pine) managed on 25-30 year rotations, growing at $25m^3$/HA/yr. Over 50 per cent of land used is in agriculture, of which up to 5MHA is considered to be 'unsustainable' pasture. Since the removal of agricultural subsidies in the late 1980's, more than 50,000 HA per year (and in some years as high as 100,000 HA) of marginal agricultural land are being converted to plantation forest. Satellite imagery assessments are done every 5 years to produce the Land Cover Data Base (LCDB).

Carbon storage data in planted forests is assessed at the 'stand' level. Once a 'normal' forest is established, there are equal areas of stands in each age class and the annual sequestration in the forest is equal to the total carbon in a single stand. Stand growth models have been developed by species for each region from an assessment of permanent sample plots (over 50,000 across New Zealand). Stand growth models are widely used in New Zealand forestry and in Australia, to determine stem volumes. Stem volume is converted to total stand carbon using a physiological growth model. This has been developed from destructive biomass assessments at 5 yearly intervals. Annual data collection from forest companies, land owners, and forest nurseries is used to validate areas from the LCDB and provide age class and growth data. The annual data collected is compiled in a forest estate model covering individual forests, regions and the national forest state. This model is also widely used in the forest industry. Models facilitate calculation of carbon stocks and flows, and enable the use of true age class structure and associated growth patterns rather than annual averages. The stand carbon model has been tested and appears to predict conservative estimates of stand carbon (approximately 95 per cent of measured carbon).

Data on carbon fluxes in and out of the soil, and soil processes, is also collected to develop a soil carbon model which will ultimately enable assessments of likely future changes due to continued land use or land use change. Changes in soil carbon are assessed through measurement of soil carbon at paired land use sites (e.g. pasture and neighbouring pine plantation). Significant decreases in soil carbon have been observed in the top 10 cm due to afforestation. However, there have been insignificant changes when the soil carbon is considered to a greater depth.

Our analysis of increases in carbon stock from Article 3.3 activities assumes a land use change based definition of afforestation, reforestation and deforestation. The projected increase in stock in New Zealand's "Kyoto forest" over 2008-2012 is >35 MtC (>130 $MtCO_2$). Levels of deforestation in New Zealand are negligible.

SWEDEN

In Sweden, a regular survey of the forests, the National Forest Inventory (NFI), has been ongoing since 1923. For a long time the major focus was the amount, growth , and removals of timber, while aspects related to topics such as the preservation of biodiversity have only lately been included. A major step in the latter direction was the introduction of the National Survey of Forest Soils and Vegetation (NSFSV) in 1983. The two inventories are closely connected. Each year some 8,000 sample plots are randomly laid out on forest land. About 30 per cent of these are permanent (revisited at certain intervals) while the remaining plots are temporary (visited only once). Analyses on soils and non-tree biomass are only made in the permanent sample plots.

Although not originally designed for providing information in relation to carbon budgets and climate change, the two inventories provide useful data also in this respect. NFI measurements of tree volume, biomass, tree growth, timber harvesting and mortality make it possible to to determine how much carbon is sequestered in tree biomass. Soil samples from the NSFVS inventory analysed for carbon content are important for determining what amount of carbon is sequestered in soils. To estimate the annual growth at a national level two different procedures can be adopted; the first is based on the measurements of increment cores made on sample trees, the second is based on differences in biomass in remeasured permanent plots.

Regarding accuracy in estimates, the random layout of plots is motivated by a strong wish to avoid severe systematic error. The random sampling error in country level estimates of total timber volume or total tree biomass are very small, less than 2 per cent standard error when calculating a mean value from five years data. Concerning growth, the estimates are still quite good and the standard error from five fear data using the increment method is below 5 per cent at the country level. Uncertainty is larger for growth estimated from differences in biomass in remeasured permanent plots. The random sampling error are even higher when it comes to estimating the change in soil carbon.

The annual growth is about 100 M m^3 (average for 1992-1996). The annual harvest has varied in the range 64.0 to 77.5 M m^3 from 1990 to 1997. The annual sink has been ca 30 M m^3 corresponding to 6 M ton C in stemwood or 9 M ton C in biomass. The annual sink in forests correspond to about 50 per cent of the annual CO_2 emission from fossil fuels in Sweden. The standing tree volume has increased steadily from 1760 M m^3 in 1926 to 2930 M m^3 in 1994.

The managed forest area in 1983-1987 was ca 23.4 M HA and 22.6 M HA in 1992 to 96. The difference is primarily due to an increase in forest conservation area of ca 0.7 M HA. The annual deforestation due to conversion of forests to agricultural lands, road, powerlines and construction areas has been about 10 000 HA, while the annual afforestation has been about 16000 HA according to NFI. Only 3000 HA/year has received subsidies for planting trees on agricultural lands. The annual afforestation/deforestation areas constitute a very minor portion of the total forested area and e.g. part of the annual afforestation estimated from NFI may be due to shifts in classification due to slow natural forestation of former pasture land.

The net sink from afforestation/deforestation relevant to Art. 3.3 may be very small or even negative although the forestry sector overall constitute a large net sink in Sweden. The annual reforestation is ca 200,000 HA by planting seeding or natural regeneration after harvest.

The crediting according to Art. 3.3 may be anything from 0 to 200,000 HA depending on choice of definition for reforestation.

SWITZERLAND

Forestry principles

Article 3 of the Federal Law on Forests states that "the forest area shall not be reduced". Therefore, all forest areas are protected. Deforestation is principally forbidden. Very few exceptions are possible, except in cases which are ruled as being of a higher priority than forest conservation. However, in such cases, compensation must be made by afforestation of an equivalent surface area. Allowed clearings are in the range of 100 to 200 HA/y (0.01 to 0.02 per cent of the forest area).

Principles of forest management and conserving biodiversity are adhered to, that is:

- silvicultural practices must respect natural conditions. Natural regeneration is prescribed wherever possible even for afforestations and reforestations;
- clear cuts are prohibited (>0.5 HA surface area); and
- the use of environmentally hazardous substances is prohibited (pesticides, herbicides, fertilizers)

For adaptation and biodiversity reasons natural regeneration has first priority for reforestations and afforestations.

Swiss data Sources

Forest assessments are based on:

- Temperate and Boreal Forest Resources Assessment 2000 (TBFRA)
- Criteria and Indicators for sustainable Forest Management adopted by the Third Ministerial Conference on the Protection of Forest in Europe in Lisbon, 2 to 4 June 1998.

Afforestations and reforestations are legally treated as forests. The afforested area is deduced from the change of the forest area. New definitions and methods would require a special assessment and cause additional costs and would probably result in a higher degree of uncertainty.

Forests and wood economy survey

A forest survey, including irregular reports and statistics, was conducted from1878 to 1929. Since 1930, a yearly survey has been done. Its contents include: forest area, harvested volume (hard-softwood), number of planted trees, forest fires and other data.

National forest inventory

The first inventory was done between 1983 and1985 based on a ground assessment in a 1x1 km grid. The second was done between 1993 and 1995 based on a ground assessment in a 1x2 km grid and on aerial photographs. The content includes: forest area, standing volume, species and other data. A comparison of the two approaches is shown below for forest area:

	Survey	NFI
1985	1'184'571 HA	1'186'300 HA
1995	1'206'293 HA	1'234'000 HA

Forest soil carbon

A first rough estimate of carbon content in forest soils is 180 MtC (Biomass 115 Mt). A sound assessment based on soil carbon measurements is in preparation. A first assessment of carbon balance of forest soils resulted in a sequestration amount of 0.35 MtC for Switzerland in the year 1985. (For comparison: the gross carbon uptake in forest biomass is estimated to be 2.73 in the same year).

UKRAINE

Vegetation

According to the latest state census on woods and forest (January 01, 1998), the total forest area in Ukraine is estimated at 9.9 million HA, with 8.6 million HA currently under forest cover. The total volume of timber in Ukrainian forests is estimated at 1.3 billion m^3, with an average timber volume per hectare of 153 m^3 in woodlands and 253 m^3 in mature forests. Average annual timber growth per hectare of forestland is estimated at 4.2 m^3.
Coniferous forests account for 45 per cent of woodlands, deciduous hardwoods for 41 per cent and deciduous softwoods and others for 14 per cent. Studies undertaken by Ukrainian National Agrarian University have established that the 945 million tons of phytomass in Ukrainian forests represent (as of January 01, 1998) more than 469 million tons of accumulated carbon.
In 1996, 11,410,000 m^3 of commercial timber, including 5,000,700 m^3 of construction poles, were logged and sorted in Ukraine by different methods.

Ecological and economic forest status in Ukraine

In general terms, the state of the woods and forest in Ukraine did not meet the ecological and economic requirements. At present, the forest raw resource is exhausted. The evidence for this situation is the data from the state forest census, indicating that the forest is composed of young plantations represent 47 per cent, middle-aged - 38 per cent, almost mature - 9 per cent, mature and overmature - only 6 per cent. A distressing situation exists because there is an annual deficit of between 18 to 20 million tons in Ukrainian timber supplies compared to national needs. A strong trend toward forest utilization is becoming evident. Logging and timber sorting decreased from 15.3 million m^3 in 1990 to 11.4 million m^3 in 1996, including those of final cuttings from 6.0 to 5.0 million m^3 respectively.

Reforestation and forest reproduction

In 1996, reforestation was performed over an area of 38.5 thousand HA. This included: creation of new forest cultures - 34.3 thousand HA (89.1 per cent of total reforestation bulk extent) and 4.2 thousand HA (10.9 per cent of total reforestation bulk extent) with the aid of natural reforestation. Reforestation activities have been continued. For instance, this year, new forests were planted in ravines, gorges, and on sandy and other unfit lands (12.1 thousand HA) and as field-protection forest belts (1.4 thousand HA). During the last five years, annual reforestation and forest reproductive capacity has remained almost constant.

Also in 1996, 30.5 thousand HA of forest was cultured and 3.6 thousand HA of natural reforestation plots were transferred to wooded land. Also, commissioned were11.6 thousand HA of protective forests in ravines, gorges and on sandy and other unfit lands, and 2.1 thousand HA of field protection forest belts.

In 1996, the following lands were reclaimed: low value plantations (0.9. thousand HA), running purpose-defined plantations (0.3 thousand HA) and forest plantations with selected planting material (1.7 thousand HA).

Green areas in populated areas and industrial centres

As of January 01, 1998, green areas of all types in cities and towns covered about 500,000 HA, including about 118,000 hectares of general-purpose plantations. Throughout the Ukraine, only 12.5 per cent of all existing green areas and 23.4 per cent of general-purpose plantations were receiving appropriate care as compared to 15 per cent and 50 per cent respectively in 1995. Efforts to create new green areas have declined steadily since1991, by a factor of fifteen in 1995 and a factor 6-fold drop since 1990.

Landscaping efforts in existing green areas are also declining (factor of 2.4 since 1995, a factor of 5.5 since 1990).

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND

The UK has quantified the amount of carbon contained in all vegetation and soils at a 1x1 km scale. Totalled for the whole UK, about 120 MtC is contained in vegetation and 10,000 MtC in soils, half of which is in peats. A comprehensive inventory has been developed of the annual gains and losses (sinks and sources) of carbon to and from these pools as a result of land use change and natural processes, for the year 1990. Overall, sources exceed sinks, mainly because of the loss of carbon from previously cultivated organic soils and peats.

For the categories included in the IPCC 1996 guidelines, sinks are about 3.4 MtC/yr and sources about 8.8 MtC/yr. The sinks include about 2.5 MtC/yr absorbed by plantation forests which have been established on former non-forest land since the 1920s. In the UK, deforestation losses are negligible. Estimates of future forest planting suggest that the Kyoto forests, defined by Article 3.3 in the Protocol may absorb about 0.5 MtC/yr by 2010.

PRESENTATIONS BY OTHER ORGANIZATIONS

EUROPEAN FOREST INSTITUTE
JOENSUU, FINLAND

Information was provided about two topics relevant to the Land-use Change and Forestry, namely, an analysis of current state of forest inventories in Europe; and forest scenario studies at the European level.

In 1996-1997 the European Forest Institute carried out a project under the European Forest Information and Communication System (EFICS). The project reviewed the current inventory systems in Europe. Inventories are roughly comparable, but the exact definitions and measurement techniques differ considerably between the countries. Some examples of how countries define forest, standing volume, regeneration and increment are shown. With a harmonised database and the European Forest Information Scenario model (EFISCEN), analyses of future European forest resources are being made. Different development lines are being pursued, for example, the incorporation of the effects of climate change, a full European forest carbon balance and "nature oriented" forest management approaches. Case study results for the Leningrad Region in Russia were shown.

INTEGRATED RESOURCE INVENTORIES AND ASSESSMENTS
MANASSAS, VIRGINA, UNITED STATES OF AMERICA

This paper lists various definitions that have been used or are in use for deforestation, afforestation, and reforestation. To have a clear understanding of these terms there is also a need to define terms such as: tree, forest, and degradation. The definitions presented were derived from a search via the Internet, the literature and from individual submissions. The sources and contacts are listed at the end of the paper. A short discussion and comparison at the end of each set of definitions is presented. See also http://home.att.net/~gklund/DEFpaper.html.